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(71) Applicant
Air Industrie Environment,
(Incorporated in France),
27 boulevard de la Paix, 78100 Saint Germain en Laye, France

(72) Inventors
Albert Rebours,
Arthur John Chambers

(74) Agent and/or Address for Service
Stanley Popplewell Poole, 57-60 Lincoln's Inn Fields, London WC2A 3LS

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(54) Towers for cooling dust-laden gases

(57) Tower for cooling dust-laden gases is provided with a supply duct (16) for conveying the gas to be treated, which duct is connected to the top of the tower via a diffuser (12) having the shape of a truncated cone, and with water spraying nozzles located inside the upper part of the tower.

In order to improve the distribution of the gases inside a transverse section of the tower, a body of revolution (20), the diameter of which progressively increases in the direction of flow of the gases is placed inside the diffuser (12), preferably in its upper part.

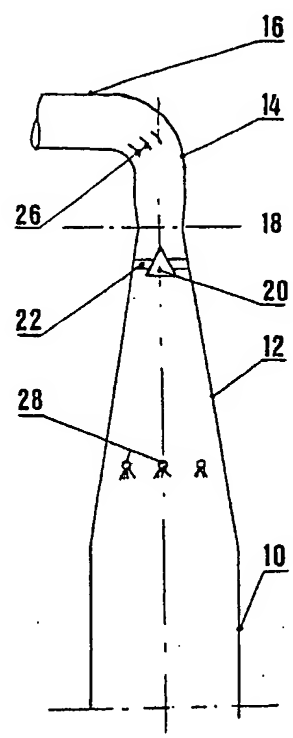

Fig. 1

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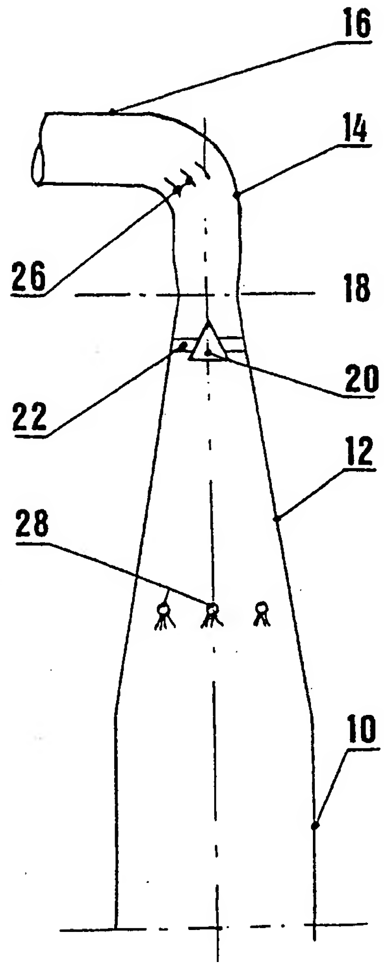

Fig.1

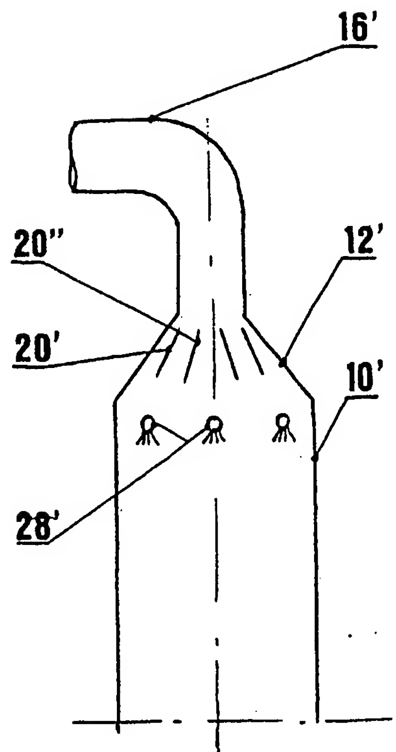

Fig.2

SPECIFICATION

Improvement to towers for cooling dust-laden gases

The present invention relates to towers for cooling dust-laden gases, in particular, fumes, which consist of a vertical chamber with a circular cross-section and are provided with a supply duct for conveying the gases to be treated to one end of the tower, with spraying nozzles arranged at this same end of the tower for injecting a liquid, generally water, in a finely divided form into the gas stream, and with a discharge duct for the treated gases at the other end of the tower.

These towers are used, in particular, to treat fumes before they pass into a dust separator in order to regulate their temperature and/or their degree of moisture such that the dust separator is able to operate in an optimum manner.

One of the problems which must be resolved with regard to the design and operation of these towers is that of uniformly distributing the water droplets in the gases. This problem arises mainly from the fact that the speed of the gases is not constant over the entire cross-section of the tower, in the region of the spraying nozzles. The non-uniform distribution of the speeds is due essentially to the fact that the supply duct has a cross-section distinctly smaller than that of the tower and forms an angle generally of about 90 degrees with the axis of the tower. In order to remedy the first defect, the duct is connected to the tower via a diffuser having the shape of a truncated cone, but this solution is not perfect and the speed of the gases along the walls of the towers is still slower than the speed along the axis of the tower. The change in direction which is imparted to the gases when they pass from the supply duct into the tower or into the diffuser has the effect of creating a dissymmetrical distribution of the speeds, and an attempt has been made to correct this by placing, inside the elbow piece connecting the duct to the tower, a series of curved deflectors which divide the gas into several elementary streams. This solution also has not proved to be very effective. Moreover, the separation which occurs along the wall with the appearance of return currents causes the droplets to be projected onto the wall, with the risk of corrosion of the latter.

The aim of the present invention is to improve the distribution of the gases in a transverse section of the tower, in particular by increasing the speed of the gases along the walls of the tower.

The cooling tower which is the subject of the present invention is characterized in that it comprises, in a manner known per se, a diffuser having the shape of a truncated cone, located at one end of the tower, co-axilly in relation to the latter, and in that a body of revolution, the diameter of which increases in the direction of flow of the gases, is placed inside the diffuser, along the axis of the latter and in its narrow part, so as to form, with the wall of the diffuser, a diverging passage with an annular cross-section, the spraying nozzles being located inside the widened part of the diffuser or inside the tower, at a distance from the said body of revolution, in a zone where the speed of the gases is practically constant over the entire cross-section of the diffuser or of the tower. This body may be closed at its upstream end and may consist, for example, of a cone. It may also be hollow and open at its two ends. In this latter case, several bodies of revolution with a diameter which progressively increases in the direction of flow of the gases may be arranged concentrically inside the upper part of the diffuser; several concentric cone sections, for example, may be provided therein.

The body of revolution may be supported by several radial vanes fixed to the wall of the diffuser; these vanes are preferably profiled and arranged so as to be vertical or slightly inclined relative to the vertical.

The following description refers to the accompanying drawings which show, by way of a non-limiting example, two embodiments of the invention and in which:

Figure 1 is a view, in elevation and cross-section, of the upper part of a cooling tower constructed according to the invention; and

Figure 2 is a partial view, in elevation and in cross-section, of another embodiment of the invention.

Figure 1 shows the upper part of a cooling tower 10 which is connected, via a diffuser 12 having the shape of a truncated cone and an elbow piece 14, to a duct 16 supplying the gases to be treated. The vertical part of the elbow piece converges slightly such that it forms, together with the diffuser 12, a venturi, the neck of which is situated in the plane 18 where they are joined together. A cone 20 is placed inside the upper part of the diffuser, below the plane 18. This cone, which is made of sheet metal, may be closed or open at its at base. It is supported by radial vanes 22 fixed to the cone and to the diffuser. These vanes have, in cross section, a profiled shape in the direction of flow of the gases and their mid-plane is either vertical or slightly inclined so as to impart a slight rotational movement to the gas flow.

Curved deflectors 26 are placed inside the elbow piece 14 and spraying nozzles 28 are arranged inside the lower part of the diffuser, at a distance from the cone 20, in a zone where the speed of the gases is practically constant over the entire cross-section of the diffuser.

In the embodiment shown in Figure 2, the angle at the top of the diffuser 12 is much greater than that of the diffuser shown in Figure 1, and the cone 20 is replaced by two concentric cone sections 20' and 20" arranged coaxially inside the diffuser. These two cone sections form, together with the wall of the diffuser, two concentric passages with an annular cross-section, and a central passage. The central cone section 20" could be replaced by a cone. The spraying nozzles 28' are arranged inside the upper part of the tower 10, at a certain distance from the base of the cone sections, in a zone where the speed of the gases is practically constant over the entire cross-section of the tower. If necessary, more than two concentric cone sections may be provided. The cone sections are supported by radial vanes which which have not been shown.

Although the above description relates to a tower which admits the gases to be treated at the top and discharges the treated gases at the bottom, the invention is also applicable to towers in which the gases are

admitted at the bottom of the tower and discharged at the top thereof, the spraying nozzles in this case being located in the lower part of the tower.

CLAIMS

1. Tower for cooling dust-laden gases, in particular fumes, consisting of a vertical chamber with a circular cross-section and provided with a supply duct for conveying the gases to be treated to one end of the tower and with water spraying nozzles located at this same end of the tower, the supply duct being connected to the tower via a diffuser having the shape of a truncated cone, located at the same end of the tower, coaxially in relation to the latter, characterized in that a body of revolution (20, 20', 20"), the diameter of which progressively increases in the direction of flow of the gases, is placed inside the diffuser (12, 12') along the axis of the latter and in its narrow part, so as to form, with the wall of the diffuser, a passage with a diverging annular cross-section, the spraying nozzles being located inside the widened part of the diffuser or inside the tower, at a distance from the said body of revolution, in a zone where the speed of the gases is practically constant over the entire cross-section of the diffuser or of the tower.

2. Cooling tower according to Claim 1, characterized in that the said body of revolution (20) is closed at its upstream end.

3. Cooling tower according to Claim 2, characterized in that the said body consists of a cone (20), the tip of which is oriented upstream.

4. Cooling tower according to Claim 1, characterized in that the said body of revolution (20') is open at at its two ends.

5. Cooling tower according to Claim 4, characterized in that the said body (20') has the shape of a truncated cone.

6. Cooling tower according to Claim 4 or 5, characterized in that several bodies of revolution (20, 20") are placed concentrically inside the diffuser.

7. Cooling tower according to any one of the preceding claims, characterized in that the said body of revolution is supported by vanes (22) which are fixed to the wall of the diffuser and the mid-plane of which is slightly inclined relative to the vertical.

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